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PLANT PARASITIC NEMATODES ASSOCIATED WITH SUGARCANE IN ST. KITTS

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ABSTRACT

In 1982, an evaluation was undertaken of the plant parasitic nematodes associated with sugarcane in St. Kitts. Eleven plant parasitic nematode genera were found, viz., *Pratylenchus, Helicotylenchus, Macropsthonia, Xiphinema, Meloidogyne, Paratylenchus, Tylenchorhynchus, Paratricodorus, Hemicriconemoides, Longidorus* and *Hoplolaimus*. The average number of nematodes per 200 c c soil sample ranged from 210 to 680 with an overall average of 406. Nematode population densities were influenced by varieties, the number of ratoons and the nematicide.

RESUMEN

En el año 1982, se llevó a cabo una evaluación de los nemátodos asociados con la caña de azucar, en St. Kitts. Once géneros de nemátodos fitoparasíticos, se encontraron, como ser: *Pratylenchus, Helicotylenchus, Macropsthonia, Xiphinema, Meloidogyne, Paratylenchus, Tylenchorhynchus, Paratricodorus, Hemicriconemoides, Longidorus* y *Hoplolaimus*. La cantidad media de nemátodos por 200 cc de suelo fué de los 210 a 680 con un total medio de 406. La densidad de nemátodos fué influenciada por: las variedades, el número de retoños y el nematocída.

Within recent times, there has been increased interest in the study of plant nematodes associated with sugarcane in St. Kitts. Such knowledge is an essential step in the evaluation of the role of nematodes in the soil. Sugarcane is an important crop in terms of the number of people employed, its contribution to the island GDP and value of export earnings.

Sugarcane is usually grown in monoculture in the Caribbean and this practice usually results in the build up of disease organisms. It is known that nematodes cause damage to sugarcane roots and that the amount of damage depends upon the nematode population density. This damage results in the reduction in the quality and quantity of harvested cane. To ensure a good crop it has become the standard practice in St. Kitts to apply nematicides to all plant canes without reference to the nematode population density. This has resulted in an increase in the cost of production. With the depressed international sugar prices at the moment, sugarcane has become, at best, a break-even business.

In 1982, the Government of St. Kitts requested CARDI to make an assessment of the general economic importance of nematodes on sugarcane.

The purpose of this study, therefore, was to evaluate the plant parasitic nematodes associated with sugarcane in St. Kitts.

Background

There are approximately 10,000 acres under sugarcane production in St. Kitts. A significant portion of the total sugar product (32,000 tons) is used for local consumption. Soil and climatic conditions are suitable for the growing of sugarcane in St. Kitts. Sugarcane yields are among the highest obtained in the Caribbean, averaging about 38 tons per acre.

During the past decade, the main research emphasis has been on varietal selection. However, with the appearance of the smut disease in 1978, varietal testing for resistance was initiated and some emphasis was given to minimum tillage. There has been no major insect pest problem except for the moth borer, *Diatraea saccharalis*, for which biological control is used.

Materials and methods

Soil samples were collected from sixteen sugar estates in St. Kitts. The samples were taken with a 1.5 cm borer to a depth of 15 to 17 cm. Each sample was made up of about one litre of soil collected around the sugarcane roots in 15 to 20 locations. A subsample of 200 cm^3 was processed by modified Cobb's decanting and sieving method (3). Ten percent of each nematode suspension recovered was examined under the stereo-microscope and generic counts made. Specific identifications were done under the compound microscope. In a few cases, samples were sent to the Commonwealth Institute of Parasitology for species identification.

Field data on cultivation and crop husbandry were recorded at the time of soil sampling.

Results and discussion

Data from soil samples collected from 16 districts in St. Kitts are shown in Table 1. Eleven plant parasitic nematode genera were found associated with sugarcane, namely, *Pratylenchus, Helicotylenchus, Macroposthonia, Xiphinema, Meloidogyne, Paratylenchus, Tylenchorhynchus, Paratricodorus, Hemicrinomoides, Longidorus* and *Hoplolaimus*. The last four named plant nematode genera were grouped under "Other Tylenchida" because they were found in low numbers in a few samples. The average number of nematodes per 200 c c soil sample ranged from 210 to 680, with an overall average of 406.

Species of nematodes identified were *Macroposthonia sphaerocephala, Hemicriconemoides mangiferae, Xiphinema vulgare, Longidorus laevicapitatus, Pratylenchus brachyurus, Helicotylenchus dihystera, Hoplolaimus columbus* and *Tylenchorhynchus ammulatus*.

Populations of *Pratylenchus* and *Helicotylenchus* were high and were widely distributed throughout the sugarcane growing areas. These nematode population

densities are more than two times higher than those reported for sugarcane from Barbados and Trinidad by Brathwaite (1, 2). Furthermore, the population density of *Pratylenchus* was far above the economic threshold level reported for this crop by Persad (4).

Macroposthonia was frequently encountered, but its economic importance in sugarcane is not known. Of particular importance also is the occurrence of *Xiphinema, Meloidogyne* and *Tylenchorhynchus.* These genera include some of the most damaging nematode pests to sugarcane (4, 5).

The data showed that the varieties, B59136, B63118 and B5970 harbour a higher nematode population than B63371 (Table 2). This may be due to differences in susceptibility of the varieties.

It is noteworthy that the nematode population densities increased markedly with every subsequent ratoon (Table 3). Plant cane had a lower nematode population density, as compared with the first ratoon or the seond ratoon. Correspondingly, sugarcane yield usually declines progressively with every ratoon until after the fourth or fifth ratoon, when the cummulative loss in tonnage is usually greater than the revenue obtained from the cane. At that point sugarcane becomes uneconomical and the land is usually treated before replanting is done. It is interesting to note that in Jamaica the highest yield is obtained in the first ratoon and not in the plant cane, as in the case of St. Kitts. This may be due to the effect of the nematicide that is generally applied to all plant cane in St. Kitts.

The data showed that soil application of Carbofuran reduced markedly the nematode populations below those of the control (Table 4). Other workers (4, 5) also found the Carbofuran was effective in reducing the nematode population in sugarcane. It was difficult to correlate the nematode population with yield in the absence of yield data. Not withstanding the high yield obtained in St. Kitts, however, it could be said that nematodes may be partly responsible for yield losses.

Further work into a number of crop husbandry problems should be undertaken, e.g., an evaluation of the economics of the nematicide, an investigation to find resistant sugarcane varieties.

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Table 1 Mean number and frequency of occurrence of plant parasitic nematode genera in soil samples of sugar cane from various estates in st. Kitts

District	No of samples	Nematode genera per 200cc/soil											
		Pratylenchus	Paratylenchus	Helicotylenchus	Tylenchus	Tylenchorhynchus	Aphelenchus	Macroposthonia	Meloidogyne	Other Tylenchida	Xiphinema	Saprophytic	Total
Ponds Needs-	12	102	50	—	1	4	8	85	0	22	11	56	347
must		(12)	(8)	(0)	(1)	(4)	(0)	(11)	(3)	(10)	(5)	(12)	—
Cranstdun	4	110	—	93	10	15	5	33	—	5	20	40	347
		(4)	(0)	(4)	(3)	(4)	(2)	(3)	(0)	(2)	(2)	(4)	—
Stapleton	2	160	20	150	75	—	20	45	15	15	5	90	595
		(2)	(2)	(2)	(2)	(0)	(2)	(1)	(1)	(1)	(1)	(2)	—
Bourres	2	320	5	70	20	65	—	35	10	35	10	110	680
		(2)	(1)	(2)	(1)	(2)	(0)	(2)	(1)	(2)	(1)	(2)	—
Buckleys	1	60	20	190	20	—	20	40	10	20	—	70	450
Stonefort	1	30	40	90	—	10	—	20	20	40	—	50	300
Winefield	1	40	10	80	30	30	20	90	10	100	70	70	500
Con Phipps	1	10	—	—	—	—	—	90	—	40	50	120	310
Canada	1	80	70	—	10	—	—	40	—	30	10	90	330
Brighton	1	60	—	110	—	60	—	30	30	10	10	90	400
Lodge	1	10	10	160	40	—	—	10	20	10	40	120	420
Lower Bourryeau	1	330	—	20	—	20	—	60	—	30	—	30	490
Molineux	1	30	—	150	50	20	10	—	—	40	—	130	430
Manson	1	230	—	130	10	—	—	—	—	—	—	20	390
Willets	1	30	—	90	10	—	—	—	—	10	—	70	210
Brotherson	1	100	—	360	10	20	—	30	10	—	30	80	640
Overall average		114	25	68	14	13	6	54	0	22	14	68	406
		(32)	(16)	(18)	(15)	(16)	(13)	(26)	(11)	(25)	(16)	(32)	—
Frequency (%)		100	50	56	0	47	50	41	81	34	78	50	100

Table 2 Mean number of plant parasitic nenatode genera in soil samples from sugar cane nurseries grouped according to variety in St. Kitts

Variety	Nematode genera per 200cc soil											
	Pratylenchus	Paratylenchus	Helicotylenchus	Tylenchus	Tylenchorhynchus	Aphelenchus	Macroposthonia	Meloidogyne	Other Tylenchida	Xiphinema	Saprophytic	Total
B59136	220	—	70	30	20	10	—	—	—	—	20	370
B63371	40	—	30		10	10	10	—	—	30	50	180
B63110	90	—	200	10	20	—	10	—	10	20	60	420
B5970	120	—	70	30	10	—	110	—	10	30	30	410

Table 3 Mean number of plant parasitic nematode genera in soil samples from sugar cane variety UCW 54/65 grouped according to plant growth stage in St. Kitts

Cycle	Nematode genera per 200cc soil								
	Prathylenchus	Paratylenchus	Aphelenchus	Macroposthonia	Meloidogyne	Other Tylenchida	Xiphinema	Saprophytic	Total
Plant Cane	80	—	10	30	0	40	—	30	190
1st Ratoon	60	40	10	20	0	40	30	100	300
2nd Ratoon	130	10	10	50	0	50	60	140	450

Table 4 Effect of the nematicide, Carbofuran, on the nematode population of sugar cane in St. Kitts

Nematicide	Nematode genera								
	Pratylenchus	Paratylenchus	Tylenchorhynchus	Macroposthonia	Meloidogyne	Other Tylenchida	Xiphinema	Saprophytic	Total
Carbofuran (B63118)	180	40	10	0	50	10	0	30	320
Control	260	100	0	50	20	0	0	30	460